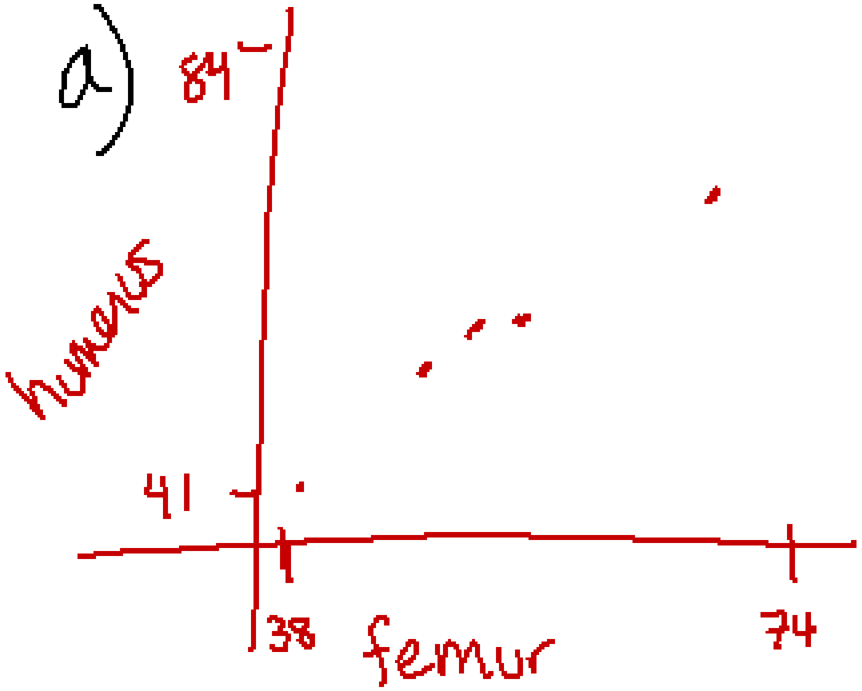
① a)



$\hat{y} = -3.66 + 1.2x$

$r = 0.994$

yes - high r and r^2

ⓑ For every increase of 1 cm of femur bone, the humerus bone increases by 1.2 cm.

Estimate for $\beta = b = 1.2$

Estimate for $\alpha = a = -3.66$

ⓒ Residuals $= e_i$

$$\left.\begin{array}{r} -0.8226 \\ -0.3668 \\ 3.0425 \\ -0.942 \\ -0.911 \end{array}\right\} e_i$$

$$S = \sqrt{\frac{\sum e_i^2}{n-2}}$$

$n = 5$

$S = 1.982$

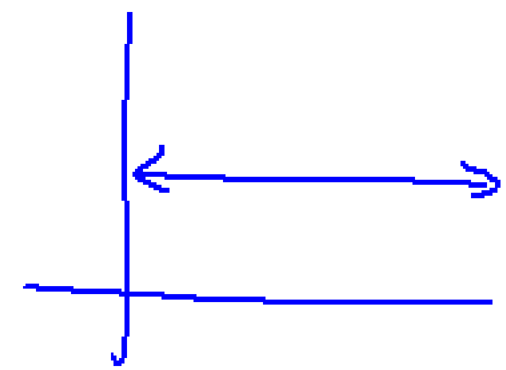
sum$(e_i) = 0$

Test on β = slope

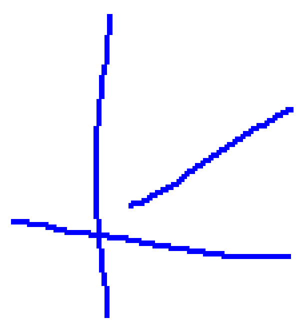
- Testing... the slope of population regression line (β) for + or −

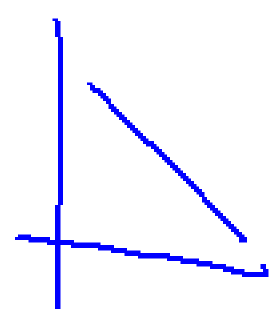
Hyp

Ho: $\beta = 0$ (no linear relationship)



Ha: $\beta \; > \; < \; \neq \; 0$





Test stat

$$t = \frac{\text{stat} - \text{param}}{\text{std. dev. of stat} = SE} = \frac{b}{SE_b}$$

$\hat{y} = a + bx$

P-value

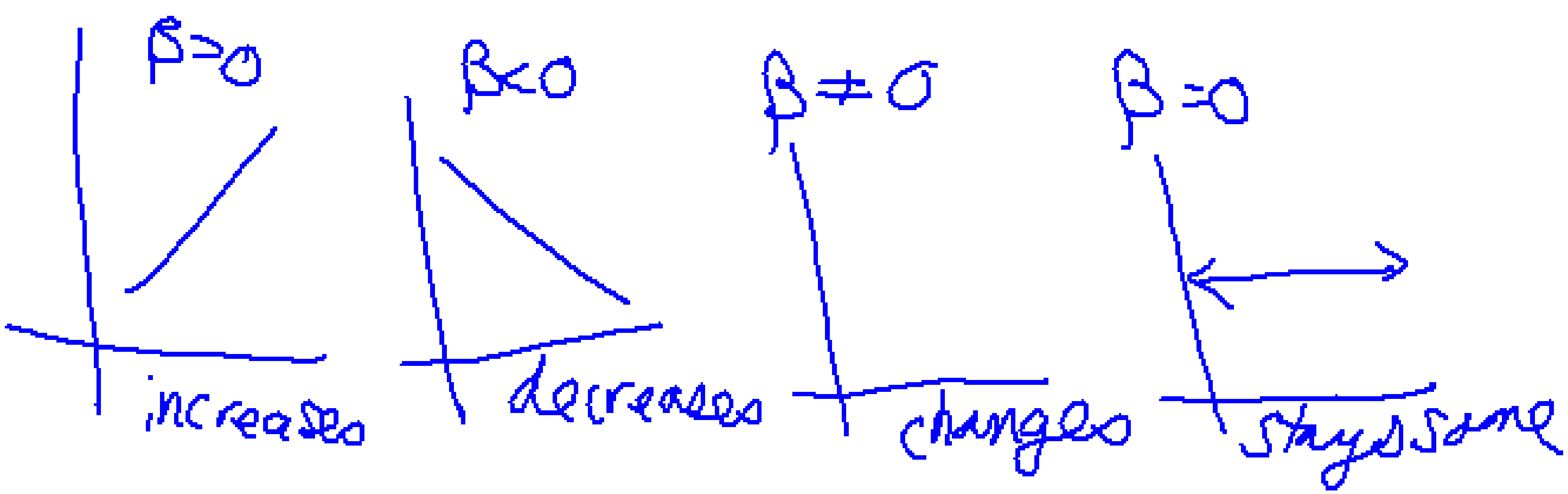
$$P(t \gtrless \underline{\text{test stat}} \mid df = n-2) = \text{tcdf}(LB, UB, df)$$

Conclusion

$H_0: \beta = 0$

$H_a: \beta \gtrless 0$ / $\beta \neq 0$

- Reject/Fail to reject...
- Suff. evid. that the slope of population regression line is $>$ $<$ $\neq$ 0.
- Thus, as x-var increases, the y-var ______ ______.



β

Conf Int:

stat $\pm$ (crit. value)(SE)

$b \pm t^* SE_b$

We are ___% conf. that the slope of the population regression line btw. x-var and y-var is btw _a_ & _b_ units.

Ex: \$/mile

Assump

1. 2 indep. SRS
2. True relationship is linear.

Check

2. assumed

p. 695

#1

Pred	Coeff	SE Std. Dev	T	P
y-int Constant	a 43.383	~~2.248~~ SE_a	X	X
x LOS	b 0.07325	0.02571 SE_b		

s = 10.21 r-Sq ~~r-Sq (adj)~~

$\hat{y} = 43.383 + 0.07325x$

$\times H_o: \beta = 0$

$\rightarrow H_a: \beta > 0$

$$t = \frac{b}{SE_b} = \frac{0.07325}{0.02571} = 2.849$$

$P(t > 2.849 \mid df = 58) = \text{tcdf}(2.849, \text{E}99, 58) = 0.003$

s = std. dev. of residuals

<u>NOT</u> SE_b

0.1174

$$t = \frac{b}{SE_b} = 4 \ldots$$

$P(\quad | df=10) = \ldots$

<u>Conf Int:</u>

$$b \pm t^* \cdot SE_b = (\quad , \quad)$$

calc.

chart

solve for

$SE_{\bar{x}}$ $SE_{\hat{p}}$

5 Assump

1. 2 indep SRS
2. true relationship is linear

Check

1. assumed
2. assumed

$H_0: \beta = 0$

$H_a: \beta > 0$ (or $\beta \neq 0$)

$n = 40$
$df = 38$

$$t = \frac{b}{SE_b} = \frac{1.8396}{0.1408} = 13.0653$$

$$P(t > 13.0653 \mid df = 38) = 6.23 \times 10^{-16}$$

- reject Ho b/c p-value $< \alpha = 0.05$
- Suff. evid. that the slope of the pop. regr. line is greater than 0.
- Thus as the year increases, the yield of corn increases.

$b \pm t^{*} \cdot SE_b$

chart $\rightarrow$ df = 40

$1.8396 \pm (2.021)(0.1408)$

$= (1.55504,\ 2.12416)$

We are 95% conf. that the slope of the pop. regr. line btw. year and yield is btw. 1.55504 and 2.12416 yrs/bushel.